IN THE CLAIMS:

1. (previously presented) A precoder for generating a mapped constellation signal, from an input signal, comprising:

a feedback filter, based upon a model of an impulse response of a communication channel, that generates a feedback signal as a function of the mapped constellation signal, and

a processing element that generates the mapped constellation signal from the input signal and the feedback signal, the processing element utilizing an index to a constellation of levels chosen for the precoder, wherein the constellation of levels includes a basic constellation of levels and a set of levels outside the basic constellation of levels, such that the amplitude of the mapped constellation signal is limited.

2. (previously presented) The precoder according to claim 1, wherein the processing element comprises:

an adder that adds together the feedback signal and the input signal to generate a partial result, and

a mapper that generates the mapped constellation signal by mapping a partial result outside the basic constellation of levels onto the basic constellation of levels as a function of the index to the constellation of levels for the precoder.

3. (original) The precoder according to claim 1, wherein the feedback filter includes a delay element and a weighting element such that the feedback filter multiplies a delayed version of the mapped constellation signal by the weighting element to generate the feedback signal.

4. (canceled)

5. (previously presented) The precoder according to claim 2, wherein the mapper further comprises:

a table identifying the basic constellation of levels and a mapping from the set of levels outside the basic constellation to levels inside the basic constellation.

6. (previously presented) The precoder according to claim 1, wherein each of the levels outside the basic constellation of levels is mapped onto only one level inside the basic constellation.

7. (currently amended) The precoder according to claim 5, further comprising:

a table having a constellation index basic_const, where basic_const goes from 1 to k, associated with each of a plurality of levels inside the basic constellation, and having a constellation index positive_const, where positive_const goes from k+1 to m, associated with a plurality of levels outside the basic constellation, wherein said k is a constant and said m is a multiple of said k.

8. (original) The precoder according to claim 7, wherein each of the plurality of levels outside the basic constellation index are mapped onto a level inside the basic constellation according to the equation:

index positive_const→positive_const-(2*k); while positive _const>m-k; and

index positive_const→positive_const-(2*k)-1; while positive _const<=m-k;

wherein→identifies the mapping function.

9. (original) The precoder according to claim 5, further comprising:

a table having a constellation index basic_const, where basic_const goes from -1 to -k, associated with each of a plurality of levels inside the basic constellation, and having a constellation index negative_const, where negative_const goes from -k-1 to-m, associated with a plurality of levels outside the basic constellation.

10. (original) The precoder according to claim 9, wherein each of the plurality of levels outside the basic constellation index are mapped onto a level inside the basic constellation according to the equation:

index negative_const→negative_const + (2*k); while negative_const<-(m-k); and

index negative_const→negative_const + (2*k)+1; while negative_const>=-(m-k);

wherein→ identifies the mapping function.

11. (original) The precoder according to claim 7, wherein the mapper further comprises a comparator for comparing the partial result with the levels in the table.

12. (original) The precoder according to claim 11, wherein the comparator identifies the level closest to the partial result.

13. (original) The precoder according to claim 12, wherein the mapper further includes an output block that generates a mapped constellation signal equal to a level inside the basic constellation, if the identified level in the table closest to the partial result is inside the basic constellation.

14. (previously presented) The precoder according to claim 13, wherein the output block includes a summer for adding the partial result and a mapping distance signal, wherein the mapping distance signal equals the distance between the index basic_const, associate with the basic constellation level of the input signal, and the index positive_const, associated with a level outside the basic constellation.

15. (original) The precoder according to claim 1, further comprising a digital to analog converter that generates an analog output signal based upon the mapped constellation signal.

16. (original) The precoder according to claim 15, further comprising a transformer for operably coupling the digital to analog converter to an analog subscriber loop.

17. (previously presented) The precoder according to claim 1, wherein successive levels in the basic constellation of levels are separated by a distance D1, and wherein a plurality of successive levels outside the basic constellation are separated by a distance D2 such that D1 differs from D2.

18. (previously presented) A precoder for an analog modem, the precoder comprising:

a processing element that generates a mapped constellation signal as a function of a feedback signal and an input signal to the precoder, the processing element including:

an adder that adds together the feedback signal and the input signal to generate a partial result,

a table identifying a basic constellation of levels and levels outside the basic constellation, wherein the levels outside the basic constellation are mapped onto levels inside the basic constellation as a function of an index associated with each level in the table,

an output block that generates a mapped constellation signal equal to a level inside the basic constellation by mapping a partial result outside the basic constellation of levels onto a level inside the basic constellation of levels, and

a feedback filter that generates the feedback signal as a function of the mapped constellation signal output by the processing element.

19. (original) The precoder according to claim 18, wherein each of the levels outside the basic constellation in the table are mapped onto only one level inside the basic constellation in the table.

20. (original) The precoder according to claim 18, further comprising

a table having a constellation index basic_const, where basic_const goes from 1 to k, associated with each of a plurality of levels inside the basic constellation, and having a

constellation index positive_const, where positive_const goes from k+1 to m, associated with a plurality of levels outside the basic constellation.

21. (original) The precoder according to claim 20, wherein each of the plurality of levels outside the basic constellation index are mapped onto a level inside the basic constellation according to the equation:

index positive_const→positive_const _ (2*k); while positive_const>m-k; and

index positive_const→positive_const - (2*k)-1; while positive_const<=m-k;

wherein → identifies the mapping function.

22. (original) The precoder according to claim 18, further comprising:

a table having a constellation index basic_const, where basic_ const goes from -1 to -k, associated with each of a plurality of levels inside the basic constellation, and having a constellation index negative_const, where negative _const goes from -k-1 to -m, associated with a plurality of levels outside the basic constellation.

23. (original) The precoder according to claim 22, wherein each of the plurality of levels outside the basic constellation index are mapped onto a level inside the basic constellation according to the equation:

index negative_const→negative_const+(2*k); while negative_const<-(m-k); and

index negative_const→negative_const+(2*k)+1; while negative_const>=-(m-k);

wherein → identifies the mapping function.

24. (original) The precoder according to claim 20, wherein the output block includes a summer for adding the partial result and a mapping distance signal, wherein the mapping distance signal equals the distance between the index basic_const, associated with the basic

constellation level of the input signal, and the index positive_const, associated with a level outside the basic constellation.

25. (currently amended) A method of precoding an input signal to generate a mapped constellation signal, comprising:

generating a feedback signal from the mapped constellation signal by multiplying a delayed version of the mapped constellation signal by a weighting element, and

performing an operation on the feedback signal and the input signal based upon an index to a constellation of levels chosen for a ~~the~~ precoder, wherein the constellation of levels includes a basic constellation of levels and a set of levels outside the basic constellation of levels, such that an amplitude of the mapped constellation signal is limited.

26. (previously presented) The method of precoding according to claim 25, wherein the step of performing the operation includes:

adding together the input signal and the feedback signal to generate a partial result,

determining whether the generated partial result is contained within the basic constellation of levels, and

generating the mapped constellation signal by mapping a partial result outside the basic constellation of levels onto a level inside the basic constellation of levels as a function of the index to the constellation of levels for the precoder.

27. (canceled)

28. (previously presented) The method according to claim 26, wherein the determining step further includes comparing the generated partial result with a table identifying the basic constellation of levels and a plurality of levels outside the basic constellation.

29. (original) The method according to claim 28, further including generating a mapped constellation signal equal to the partial result if the partial result is inside the basic constellation of levels.

30. (previously presented) The method according to claim 28, further including the step of determining whether the partial result is less than the minimum level of the basic constellation or whether the partial result is greater than a maximum level of the basic constellation.

31. (currently amended) The method according to claim 30, further including a ~~the~~ step of determining a mapping distance p_j when the partial result is less than the minimum level of the basic constellation, the mapping distance p_j being equal to a distance between an index basic_const, associated with the basic constellation level of the input signal, and an index positive_const, associated with a level outside the basic constellation, said j represents said basic constellation level and said level outside the basic constellation.~~,~~

32. (original) The method according to claim 31, wherein the index positive_const is an index to a level that maps onto the basic constellation level of the input signal, and wherein index positive_const is an index to a level in a positive constellation of levels that includes those levels greater than the maximum in the basic constellation.

33. (currently amended) The method according to claim 32, further including a ~~the~~ step of obtaining the index positive_const from a table.

34. (currently amended) The method according to claim 31, further including a ~~the~~ step of generating a mapped constellation signal by adding together the partial result and the mapping distance p_j.

35. (currently amended) The method according to claim 30, further including a ~~the~~ step of determining a mapping distance n_j, when the partial result is greater than the maximum level

of the basic constellation, the mapping distance n_j being equal to a distance between an index basic_const, associated with the basic constellation level of the input signal, and an index negative_const, associated with a level outside the basic constellation, wherein j represents said basic constellation level and said level outside the basic constellation.

36. (original) The method according to claim 35, wherein the index negative_const is an index to a level that maps onto the basic constellation level of the input signal, and wherein index negative_const is an index to a level in a negative constellation of levels that includes those levels less than the minimum level in the basic constellation.

37. (original) The method according to claim 36, further including the step of obtaining the index negative_const from a table.

38. (original) The method according to claim 35, further including the step of generating a mapped constellation signal by adding together the partial result and the mapping distance n_j.

39. (currently amended) A computer-readable medium having stored thereon a plurality of instructions, the plurality of instructions including instructions that when executed by a processor cause the processor to implement a method of precoding an input signal to generate a mapped constellation signal, the method comprising:

generating a feedback signal from the mapped constellation signal, and

performing an operation on the feedback signal and the input signal based upon an index to a constellation of levels chosen for a ~~the~~ precoder, wherein the constellation of levels includes a basic constellation of levels and a set of levels outside the basic constellation of levels, such that an amplitude of the mapped constellation signal is limited, the performing including:

adding together the input signal and the feedback signal to generate a partial result,

determining whether the generated partial result is contained within the basic constellation of levels, and

generating the mapped constellation signal by mapping a partial result outside the basic constellation of levels onto a level inside the basic constellation of levels.

40. (canceled)

41. (previously presented) The precoder according to claim 1 wherein the amplitude of the mapped constellation signal is limited to the basic constellation of levels.

42. (previously presented) The precoder according to claim 18 wherein a first distance between successive levels in the basic constellation of levels differs from a second distance between successive levels outside the basic constellation of levels.

43. (previously presented) The method according to claim 25 wherein the step of performing includes limiting the amplitude of the mapped constellation signal by the basic constellation of levels.

44. (previously presented) The method according to claim 25 wherein a first distance between successive levels in the basic constellation of levels differs from a second distance between successive levels outside the basic constellation of levels.

45. (previously presented) The method according to claim 25 wherein the step of performing includes mapping each level outside the basic constellation of levels onto only one level inside the basic constellation of levels.

46. (previously presented) The computer-readable medium of claim 39 wherein the amplitude of the mapped constellation signal is limited to the basic constellation of levels.

47. (previously presented) The computer-readable medium of claim 39 wherein a first distance between successive levels in the basic constellation of levels differs from a second distance between successive levels outside the basic constellation of levels.

48. (previously presented) The computer-readable medium of claim 39 wherein the step of performing includes mapping each level outside the basic constellation of levels onto only one level inside the basic constellation of levels.

49. (currently amended) An apparatus for generating a mapped constellation signal from an input signal, comprising:

a precoder configured to generate ~~that generates~~ the mapped constellation signal from the input signal and a feedback signal using ~~, wherein the precoder utilizes~~ a constellation of levels that includes ~~include~~ a basic constellation of levels having successive levels that are separated by a distance D1 and a set of levels outside the basic constellation of levels wherein a plurality of successive levels outside the basic constellation are separated by a distance D2 such that D1 differs from D2, and wherein the precoder is configured to associate ~~associates~~ an index with each of the levels in the constellation of levels such that the levels outside the basic constellation of levels are ~~can be~~ associated with the levels inside the basic constellation of levels.

50. (previously presented) The apparatus according to claim 49 further including a feedback filter having a delay element and a weighting element such that the feedback filter multiplies a delayed version of the mapped constellation signal by the weighting element to generate the feedback signal.

51. (previously presented) The apparatus according to claim 49 further including a feedback filter based upon a model of an impulse response of a communication channel.

52. (previously presented) The apparatus according to claim 49 wherein the precoder employs an adder that adds together the feedback signal and the input signal to generate a partial result and a mapper that generates the mapped constellation signal by mapping a partial result outside the basic constellation of levels onto the basic constellation of levels as a function of the index to the constellation of levels, the mapper having a table to identify the basic constellation of levels and associate levels outside the basic constellation to levels inside the basic constellation.

53. (previously presented) The apparatus according to claim 49 wherein each of the levels outside the basic constellation are only associated with one level inside the basic constellation.

54. (currently amended) The apparatus according to claim 49 further comprising a table that identifies the basic constellation of levels, wherein the table has a constellation index basic_const, where basic_const goes from 1 to k, associated with each of a plurality of levels inside the basic constellation, and wherein the precoder has a constellation index positive_const, where positive_const goes from k+1 to m, associated with a plurality of levels outside the basic constellation, wherein said k is a constant and said m is a multiple of said k.

55. (currently amended) The apparatus according to claim 54 wherein the precoder ~~mapper~~ maps each of the plurality of levels outside the basic constellation index onto a level inside the basic constellation according to the equation:

index positive_const→positive_const-(2*k); while positive _const>m-k; and

index positive_const→positive_const-(2*k)-1; while positive _const<=m-k;

wherein→identifies the mapping function.

56. (currently amended) The apparatus according to claim 49 further comprising a table that identifies the basic constellation of levels, wherein the table has a constellation index basic_const, where basic_const goes from -1 to -k, associated with each of a plurality of levels inside the basic constellation, and wherein the precoder has a constellation index negative_const, where negative_const goes from -k-1 to-m, associated with a plurality of levels outside the basic constellation, wherein said k is a constant and said m is a multiple of said k.

57. (currently amended) The apparatus according to claim 56 wherein the precoder ~~mapper~~ maps each of the plurality of levels outside the basic constellation index onto a level inside the basic constellation according to the equation:

index negative_const→negative_const + (2*k); while negative_const<-(m-k); and

index negative_const→negative_const + (2*k)+1; while negative_const>=-(m-k);

wherein→ identifies the mapping function.

58. (currently amended) The apparatus according to claim 52 ~~54~~ wherein the mapper further comprises a comparator for comparing the partial result with the levels in the table.

59. (previously presented) The apparatus according to claim 58 wherein the comparator identifies the level closest to the partial result.

60. (previously presented) The apparatus according to claim 59 wherein the mapper further includes an output block that generates a mapped constellation signal equal to a level inside the basic constellation, if the identified level in the table closest to the partial result is inside the basic constellation.

61. (currently amended) The apparatus according to claim 60 ~~59~~, wherein the output block includes a summer for adding the partial result and a mapping distance signal, wherein the mapping distance signal equals the distance between the index basic_const, associated with the

basic constellation level of the input signal, and the index positive_const, associated with a level outside the basic constellation.

62. (canceled)

63. (previously presented) The apparatus according to claim 49 wherein a plurality of index values are associated, respectively, with a plurality of amplitude levels in the constellation of levels.

64. (previously presented) The precoder according to claim 1 wherein a plurality of index values are associated, respectively, with a plurality of amplitude levels in the constellation of levels.

65. (previously presented) The precoder according to claim 18 wherein a plurality of index values are associated, respectively, with a plurality of amplitude levels in the constellation of levels.

66. (previously presented) The method of precoding according to claim 25 wherein a plurality of index values are associated, respectively, with a plurality of amplitude levels in the constellation of levels.

67. (previously presented) The computer-readable medium of claim 39 wherein a plurality of index values are associated, respectively, with a plurality of amplitude levels in the constellation of levels.

68. (previously presented) A precoder for generating a mapped constellation signal, from an input signal, comprising:

a feedback filter, including a delay element and a weighting element, that generates a feedback signal as a function of the mapped constellation signal by multiplying a delayed version of the mapped constellation signal by the weighting element, and

a processing element that generates the mapped constellation signal from the input signal and the feedback signal, the processing element utilizing an index to a constellation of levels chosen for the precoder, wherein the constellation of levels includes a basic constellation of levels and a set of levels outside the basic constellation of levels, such that the amplitude of the mapped constellation signal is limited.

69. (previously presented) The precoder according to claim 68, wherein the processing element comprises:

an adder that adds together the feedback signal and the input signal to generate a partial result, and

a mapper that generates the mapped constellation signal by mapping a partial result outside the basic constellation of levels onto the basic constellation of levels as a function of the index to the constellation of levels for the precoder.

70. (previously presented) The precoder according to claim 69, wherein the mapper further comprises:

a table identifying the basic constellation of levels and a mapping from the set of levels outside the basic constellation to levels inside the basic constellation.

71. (previously presented) The precoder according to claim 68, wherein each of the levels outside the basic constellation of levels is mapped onto only one level inside the basic constellation.

72. (previously presented) The precoder according to claim 70, further comprising:

a table having a constellation index basic_const, where basic_const goes from 1 to k, associated with each of a plurality of levels inside the basic constellation, and having a

constellation index positive_const, where positive_const goes from k+1 to m, associated with a plurality of levels outside the basic constellation.

73. (previously presented) The precoder according to claim 70, further comprising:

a table having a constellation index basic_const, where basic_const goes from -1 to -k, associated with each of a plurality of levels inside the basic constellation, and having a constellation index negative_const, where negative_const goes from -k-1 to-m, associated with a plurality of levels outside the basic constellation.

74. (previously presented) The precoder according to claim 72, wherein the mapper further comprises a comparator for comparing the partial result with the levels in the table.

75. (previously presented) The precoder according to claim 74, wherein the comparator identifies the level closest to the partial result.

76. (previously presented) The precoder according to claim 75, wherein the mapper further includes an output block that generates a mapped constellation signal equal to a level inside the basic constellation, if the identified level in the table closest to the partial result is inside the basic constellation.

77. (previously presented) The precoder according to claim 68, further comprising a digital to analog converter that generates an analog output signal based upon the mapped constellation signal.

78. (previously presented) The precoder according to claim 77, further comprising a transformer for operably coupling the digital to analog converter to an analog subscriber loop.

79. (previously presented) The precoder according to claim 68 wherein a plurality of index values are associated, respectively, with a plurality of amplitude levels in the constellation of levels.

80. (previously presented) A precoder for generating a mapped constellation signal, from an input signal, comprising:

a feedback filter that generates a feedback signal as a function of the mapped constellation signal, and

a processing element that generates the mapped constellation signal from the input signal and the feedback signal, the processing element utilizing an index to a constellation of levels chosen for the precoder, wherein the constellation of levels includes a basic constellation of levels having successive levels separated by a distance D1 and a set of levels outside the basic constellation of levels wherein a plurality of successive levels outside the basic constellation are separated by a distance D2 such that D1 differs from D2, such that the amplitude of the mapped constellation signal is limited.

81. (previously presented) The precoder according to claim 80, wherein the processing element comprises:

an adder that adds together the feedback signal and the input signal to generate a partial result, and

a mapper that generates the mapped constellation signal by mapping a partial result outside the basic constellation of levels onto the basic constellation of levels as a function of the index to the constellation of levels for the precoder.

82. (previously presented) The precoder according to claim 81, wherein the mapper further comprises:

a table identifying the basic constellation of levels and a mapping from the set of levels outside the basic constellation to levels inside the basic constellation.

83. (previously presented) The precoder according to claim 80, wherein each of the levels outside the basic constellation of levels is mapped onto only one level inside the basic constellation.

84. (previously presented) The precoder according to claim 82, further comprising:

a table having a constellation index basic_const, where basic_const goes from 1 to k, associated with each of a plurality of levels inside the basic constellation, and having a constellation index positive_const, where positive_const goes from k+1 to m, associated with a plurality of levels outside the basic constellation.

85. (previously presented) The precoder according to claim 82, further comprising:

a table having a constellation index basic_const, where basic_const goes from -1 to -k, associated with each of a plurality of levels inside the basic constellation, and having a constellation index negative_const, where negative_const goes from -k-1 to-m, associated with a plurality of levels outside the basic constellation.

86. (previously presented) The precoder according to claim 84, wherein the mapper further comprises a comparator for comparing the partial result with the levels in the table.

87. (previously presented) The precoder according to claim 80, further comprising a digital to analog converter that generates an analog output signal based upon the mapped constellation signal.

88. (previously presented) The precoder according to claim 87, further comprising a transformer for operably coupling the digital to analog converter to an analog subscriber loop.

89. (previously presented) The precoder according to claim 80 wherein a plurality of index values are associated, respectively, with a plurality of amplitude levels in the constellation of levels.

90. (currently amended) An apparatus for generating a mapped constellation signal from an input signal, comprising:

a feedback filter having a delay element and a weighting element such that the feedback filter multiplies a delayed version of the mapped constellation signal by the weighting element to generate a feedback signal, and

a precoder configured to generate ~~that generates~~ the mapped constellation signal from the input signal and the feedback signal, wherein the precoder utilizes a constellation of levels that include a basic constellation of levels and a set of levels outside the basic constellation of levels, and wherein the precoder is configured to associate ~~associates~~ an index with each of the levels in the constellation of levels such that the levels outside the basic constellation of levels are ~~can be~~ associated with the levels inside the basic constellation of levels.

91. (previously presented) The apparatus according to claim 90 wherein each of the levels outside the basic constellation are only associated with one level inside the basic constellation.

92. (previously presented) The apparatus according to claim 90 further comprising a table that identifies the basic constellation of levels, wherein the table has a constellation index basic_const, where basic_const goes from -1 to -k, associated with each of a plurality of levels inside the basic constellation, and wherein the precoder has a constellation index negative_const, where negative_const goes from -k-1 to-m, associated with a plurality of levels outside the basic constellation.

93. (previously presented) The apparatus according to claim 92 wherein the mapper maps each of the plurality of levels outside the basic constellation index onto a level inside the basic constellation according to the equation:

index negative_const→negative_const + (2*k); while negative_const<-(m-k); and

index negative_const→negative_const + (2*k)+1; while negative_const>=-(m-k);

wherein→ identifies the mapping function.

94. (previously presented) The apparatus according to claim 90 wherein successive levels in the basic constellation are separated by a distance D1, and wherein a plurality of successive levels outside the basic constellation are separated by a distance D2 such that D1 differs from D2.

95. (previously presented) The apparatus according to claim 90 wherein a plurality of index values are associated, respectively, with a plurality of amplitude levels in the constellation of levels.

96. (currently amended) An apparatus for generating a mapped constellation signal from an input signal, comprising:

a feedback filter based upon a model of an impulse response of a communication channel that generates a feedback signal, and

a precoder configured to generate ~~that generates~~ the mapped constellation signal from the input signal and the feedback signal, wherein the precoder utilizes a constellation of levels that include a basic constellation of levels and a set of levels outside the basic constellation of levels, and wherein the precoder is configured to associate ~~associates~~ an index with each of the levels in the constellation of levels such that the levels outside the basic constellation of levels are ~~can be~~ associated with the levels inside the basic constellation of levels.

97. (previously presented) The apparatus according to claim 96 wherein each of the levels outside the basic constellation are only associated with one level inside the basic constellation.

98. (previously presented) The apparatus according to claim 96 further comprising a table that identifies the basic constellation of levels, wherein the table has a constellation index basic_const, where basic_const goes from -1 to -k, associated with each of a plurality of levels inside the basic constellation, and wherein the precoder has a constellation index negative_const, where negative_const goes from -k-1 to-m, associated with a plurality of levels outside the basic constellation.

99. (previously presented) The apparatus according to claim 96 wherein successive levels in the basic constellation are separated by a distance D1, and wherein a plurality of successive levels outside the basic constellation are separated by a distance D2 such that D1 differs from D2.

100. (previously presented) The apparatus according to claim 96 wherein a plurality of index values are associated, respectively, with a plurality of amplitude levels in the constellation of levels.

101. (currently amended) An apparatus for generating a mapped constellation signal from an input signal, comprising:

a precoder configured to generate ~~that generates~~ the mapped constellation signal from the input signal and a feedback signal, wherein the precoder utilizes a constellation of levels that include a basic constellation of levels and a set of levels outside the basic constellation of levels, and wherein the precoder is configured to associate ~~associates~~ an index with each of the levels in the constellation of levels such that the levels outside the basic constellation of levels are ~~can be~~ associated with the levels inside the basic constellation of levels, and wherein the precoder employs an adder that adds together the feedback signal and the input signal to generate a partial result and a mapper that generates the mapped constellation signal by mapping a partial result

outside the basic constellation of levels onto the basic constellation of levels as a function of the index to the constellation of levels, the mapper having a table to identify the basic constellation of levels and associate levels outside the basic constellation to levels inside the basic constellation.

102. (previously presented) The apparatus according to claim 101 wherein each of the levels outside the basic constellation are only associated with one level inside the basic constellation.

103. (previously presented) The apparatus according to claim 101 further comprising a table that identifies the basic constellation of levels, wherein the table has a constellation index basic_const, where basic_const goes from -1 to -k, associated with each of a plurality of levels inside the basic constellation, and wherein the precoder has a constellation index negative_const, where negative_const goes from -k-1 to-m, associated with a plurality of levels outside the basic constellation.

104. (previously presented) The apparatus according to claim 101 wherein successive levels in the basic constellation are separated by a distance D1, and wherein a plurality of successive levels outside the basic constellation are separated by a distance D2 such that D1 differs from D2.

105. (previously presented) The apparatus according to claim 101 wherein a plurality of index values are associated, respectively, with a plurality of amplitude levels in the constellation of levels.

106. (currently amended) An apparatus for generating a mapped constellation signal from an input signal, comprising:

a precoder configured to generate ~~that generates~~ the mapped constellation signal from the input signal and a feedback signal, wherein the precoder utilizes a constellation of levels that include a basic constellation of levels and a set of levels outside the basic constellation of levels, and wherein the precoder is configured to associate ~~associates~~ an index with each of the levels in the constellation of levels such that the levels outside the basic constellation of levels are ~~can be~~ associated with the levels inside the basic constellation of levels and the precoder employs a table that identifies the basic constellation of levels, the table having a constellation index basic_const, where basic_const goes from 1 to k, associated with each of a plurality of levels inside the basic constellation, and the precoder having a constellation index positive_const, where positive_const goes from k+1 to m, associated with a plurality of levels outside the basic constellation, wherein said k is a constant and said m is a multiple of said k.

107. (previously presented) The apparatus according to claim 106 wherein each of the levels outside the basic constellation are only associated with one level inside the basic constellation.

108. (currently amended) The apparatus according to claim 106 wherein the precoder ~~mapper~~ maps each of the plurality of levels outside the basic constellation index onto a level inside the basic constellation according to the equation:

index positive_const→positive_const-(2*k); while positive _const>m-k; and

index positive_const→positive_const-(2*k)-1; while positive _const<=m-k;

wherein→identifies the mapping function.

109. (previously presented) The apparatus according to claim 106 further comprising a table that identifies the basic constellation of levels, wherein the table has a constellation index basic_const, where basic_const goes from -1 to -k, associated with each of a plurality of levels

inside the basic constellation, and wherein the precoder has a constellation index negative_const, where negative_const goes from -k-1 to-m, associated with a plurality of levels outside the basic constellation.

110. (previously presented) The apparatus according to claim 109 wherein the mapper maps each of the plurality of levels outside the basic constellation index onto a level inside the basic constellation according to the equation:

index negative_const→negative_const + (2*k); while negative_const<-(m-k); and

index negative_const→negative_const + (2*k)+1; while negative_const>=-(m-k);

wherein→ identifies the mapping function.

111. (currently amended) The apparatus according to claim 109 ~~106~~ wherein the mapper further comprises a comparator for comparing a ~~the~~ partial result with the levels in the table.

112. (previously presented) The apparatus according to claim 111 wherein the comparator identifies the level closest to the partial result.

113. (previously presented) The apparatus according to claim 112 wherein the mapper further includes an output block that generates a mapped constellation signal equal to a level inside the basic constellation, if the identified level in the table closest to the partial result is inside the basic constellation.

114. (previously presented) The apparatus according to claim 112, wherein the output block includes a summer for adding the partial result and a mapping distance signal, wherein the mapping distance signal equals the distance between the index basic_const, associated with the basic constellation level of the input signal, and the index positive_const, associated with a level outside the basic constellation.

115. (previously presented) The apparatus according to claim 106 wherein successive levels in the basic constellation are separated by a distance D1, and wherein a plurality of successive levels outside the basic constellation are separated by a distance D2 such that D1 differs from D2.